

3.5 Polynomials of the Form $x^2 + bx + c$

Multiplying Binomials and Factoring Trinomials

$$2x(3x+5) = 6x^2 + 10x$$

Diagram illustrating the distributive property (FOIL) for the multiplication of a binomial and a monomial. The expression $2x(3x+5)$ is shown. A blue arrow labeled 'M' (Multiply) points from $2x$ to $3x$. A blue arrow labeled 'F' (First) points from $2x$ to 5 . The result is $6x^2 + 10x$.

How to multiply 2 binomials:

1. Use algebra tiles.

$$(c+5)(c+3)$$

To expand: $(c+5)(c+3)$

Make a rectangle with dimensions $c+5$ and $c+3$.

Place tiles to represent each dimension, then fill in the rectangle with tiles.

$$= c^2 + 8c + 15$$

Diagram illustrating the use of algebra tiles to represent the product $(c+5)(c+3)$. A rectangle is formed with dimensions $c+5$ and $c+3$. The tiles are arranged to represent the product, showing the result $c^2 + 8c + 15$.

The tiles that form the product are: c^2 -tile, c -tiles, and 1-tiles.

So, $(c+5)(c+3) = c^2 + 8c + 15$

Sketch the multiplication of algebra tiles for each of the following:

$(c + 4)(c + 2)$ $c^2 + 6c + 8$

$(a + 2)(a + 3)$

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2. Use an Area Model to help you:

Expand $(h + 11)(h + 5)$

L W

	h	11
h	$(h)(h) = h^2$	$(h)(11) = 11h$
5	$(5)(h) = 5h$	$(5)(11) = 55$

$$= h^2 + 16h + 55$$

So, $(h + 11)(h + 5) = ?$
 $= ?$

?

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$$(a + 20)(a + 3)$$

Area
Model

	a	20
a	a^2	$20a$
3	$3a$	60

$$= a^2 + 23a + 60$$

3. Use FOIL to multiply 2 binomials...

First
Outside
Inside
Last

$$(x + 4)(x - 5)$$

$$x^2 - 5x + 4x - 20$$

$$x^2 - x - 20$$

Example 1 Multiplying Two Binomials

Expand and simplify

Use FOIL

a) $(x - 4)(x + 2)$

$$x^2 + 2x - 4x - 8$$

$$x^2 - 2x - 8$$

b) $(8 - b)(3 - b)$

$$24 - 8b - 3b + b^2$$

$$24 - 11b + b^2$$

$$= b^2 - 11b + 24$$

CHECK YOUR UNDERSTANDING



SOLUTION

3.5 Polynomials of the Form $x^2 + bx + c$

Classwork/Homework

Page 166 #4c, 5b, 9ab(use FOIL), 12abcd

Thursday, October 20th

- Check and go over yesterday's homework
- Notes/Examples on factoring Trinomials
- Practice Questions

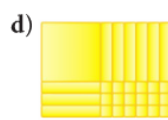
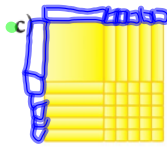
Classwork/Homework

Page 166 #4c, 5b, 9ab(use FOIL), 12abcd

4. Write the multiplication sentence that each set of algebra tiles represents.



$$(x+5)(x+5) = x^2 + 10x + 25$$



5. Use algebra tiles to determine each product. Sketch the tiles you used.

a) $(b+2)(b+5)$

b) $(n+4)(n+7)$

c) $(h+8)(h+3)$

d) $(k+1)(k+6)$



9. Multiply each pair of binomials. Sketch and label a rectangle to illustrate each product.

a) $(m+5)(m+8)$

b) $(y+9)(y+3)$

c) $(w+2)(w+16)$

d) $(k+13)(k+1)$

$$(m+5)(m+8) = m^2 + 8m + 5m + 40$$

$$(y+9)(y+3) = y^2 + 3y + 9y + 27 = y^2 + 12y + 27$$

12. Expand and simplify. Sketch a rectangle diagram to illustrate each product.

a) $(g-3)(g+7)$

b) $(h+2)(h-7)$

c) $(11-j)(2-j)$

d) $(k-3)(k+11)$

e) $(12+h)(7-h)$

f) $(m-9)(m+9)$

g) $(n-14)(n-4)$

h) $(p+6)(p-17)$

$$\rightarrow h^2 - 5h - 14$$

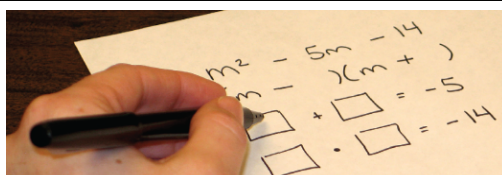
a)

h) $(p + 6)(p - 17)$

$$\xrightarrow{\text{mult}} \frac{a^2 + 7a + 12}{(a+3)(a+4)} \xleftarrow{\text{factoring}} \begin{matrix} 12 \times 1 \\ 6 \times 2 \\ 3 \times 4 \end{matrix}$$

Look at the numbers in the trinomial and the binomial.

$$v^2 + 12v + 20 = (v + 2)(v + 10)$$



Factoring a Trinomial

To determine the factors of a trinomial of the form $x^2 + bx + c$, first determine two numbers whose sum is b and whose product is c . These numbers are the constant terms in two binomial factors, each of which has x as its first term.

Example 2 Factoring Trinomials

Factor each trinomial.

a) $x^2 - 2x - 8$

You need to find two numbers that multiply to give -8 , but add to give -2 . Create a list to help you....

Factors of -8	Sum of Factors
$-1, 8$	$-1 + 8 = 7$
$1, -8$	$1 - 8 = -7$
$-2, 4$	$-2 + 4 = 2$
$2, -4$	$2 - 4 = -2$

$$= (x + 2)(x - 4)$$

CHECK YOUR UNDERSTANDING

3.5 Polynomials of the Form $x^2 + bx + c$



SOLUTION

b) $z^2 - 12z + 35$

$(z - 7)(z - 5)$

35×1
 $(-35) \times (-1)$
 $(-7) \times (-5)$
 $(7) \times 5$

Don't forget that you can always check to see if you factored correctly. You can do this by expanding (multiplying) the two binomials.

Example 3 Factoring a Trinomial Written in Ascending Order

Factor: $-24 - 5d + d^2$

$$d^2 - 5d - 24$$



CHECK YOUR UNDERSTANDING

3.5 Polynomials of the Form $x^2 + bx + c$



SOLUTION

Classwork/Homework

Page 166 # 10, 11ab, 14abcd, 15bd

Monday, October 24th

- Review Last week's work
- Check and go over Thursday's homework (Pg.166)
- Notes/Examples on removing the gcf, then factoring the trinomials
- Practice Questions

Please take out your notebooks and open to your class work from Thursday.

Note: Unit Test on Friday!!

multiply

$$(x-3)(x+5) = x^2 + 5x - 3x - 15$$
$$= x^2 + 2x - 15$$

Factor

$$a^2 - 12a + 20 = (a-10)(a-2)$$

Diagram illustrating the factoring process for $a^2 - 12a + 20$ using the AC method:

x	$+5$
-3	

Handwritten notes for factoring $a^2 - 12a + 20$:

- $20 \times \frac{1}{2} = 10 \times 2$
- $(-10) \times (-2) \leftarrow$
- $(-4) \times (-5)$
- 4×5

multiply

$$(x-3)(x+5) = x^2 + \underbrace{5x - 3x}_{2x} - 15$$

$$x^2 + 2x - 15$$

Factor

$$a^2 - 12a + 20$$

$$(a-10)(a-2)$$

Classwork/Homework

Page 166 # 10, 11ab, 14abcd, 15bd

10. Copy and complete.

- a) $(w + 3)(w + 2) = w^2 + \boxed{5}w + 6$
 b) $(x + 5)(x + \boxed{2}) = x^2 + \boxed{7}x + 10$
 c) $(y + \boxed{10})(y + \boxed{2}) = y^2 + 12y + 20$

11. Factor. Check by expanding.

- a) $x^2 + 10x + 24$ c) $m^2 + 10m + 16$
 b) $p^2 + 13p + 12$ d) $s^2 + 12s + 20$
 e) $n^2 + 12n + 11$ f) $h^2 + 8h + 12$
 g) $q^2 + 7q + 6$ h) $b^2 + 11b + 18$

(a) $(x+6)(x+4)$
 (b) $(m+8)(m+2)$

14. Factor. Check by expanding.

- a) $b^2 + 19b - 20$ c) $t^2 + 15t - 54$
 b) $x^2 + 12x - 28$ d) $n^2 - 5n - 24$
 e) $a^2 - a - 20$ f) $y^2 - 2y - 48$
 g) $m^2 - 15m + 50$ h) $a^2 - 12a + 36$

(a) $(b-1)(b+20)$
 (b) $(t-3)(t+18)$
 (c) $(x-2)(x+14)$
 (d) $(n+3)(n-8)$

15. Factor. Check by expanding.

- a) $12 + 13k + k^2$ c) $-16 - 6g + g^2$
 b) $60 + 17y + y^2$ d) $72 - z - z^2$

b) $g^2 - 6g - 16$
 $(g-8)(g+2)$

$-z^2 - z + 72$
 $(-z+8)(z+9)$
 $-z^2 - 9z + 8z + 72$
 $-z^2 - z + 72$

Example 4**Factoring a Trinomial with a Common Factor and Binomial Factors**

Factor.

$$\underline{-4t^2 - 16t + 128}$$

We are going to need to factor out the gcf first, then factor the trinomial that remains...

$$\text{GCF} = -4$$

$$-4(t^2 + 4t - 32) = -4(t - 4)(t + 8)$$

✓ **SOLUTION**

✓
CHECK YOUR UNDERSTANDING

$$\begin{array}{r} \boxed{-4 \times 8} \\ -4 \times 4 \\ -16 \times 2 \\ 16 \times 2 \\ -32 \times 1 \end{array}$$

3.5 Polynomials of the Form $x^2 + bx + c$

$$\begin{aligned} \text{a) } & \underline{4y^2 - 20y - 56} \\ & 4(y^2 - 5y - 14) \\ & 4(y - 7)(y + 2) \end{aligned}$$

$$\text{GCF} = \underline{4}$$

$$\begin{array}{r} -14 \times 1 \\ 14 \times -1 \\ \rightarrow -7 \times 2 \leftarrow \\ 7 \times -2 \end{array}$$

Classwork/Homework

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Tuesday, October 25th

- Check and go over homework (Pg.167 #21)
- Warm-up
- Begin Section 3.6
- Class work/Homework

Note: Unit Test on Friday!!

Warm-up #5

Oct. 25

1. Multiply the following:

(a) $3x(2x + 1)$

(b) $4ab(5a^2 + 3b^3)$

2. Factor the following:

$5x^2y^4 + 25x^3y^2$

3. Multiply the following:

$(x + 2)(x - 5)$

4. Factor the following:

(a) $x^2 + 9x + 20$

(b) $a^2 - 2a - 15$

Warm-up #5

Oct. 25

1. Multiply the following:

(a) $3x(2x + 1)$
 $6x^2 + 3x$

(b) $4ab(5a^2 + 3b^3)$
 $20a^3b + 12ab^4$

2. Factor the following:

$5x^2y^4 + 25x^3y^2$
 $5x^2y^2(y^2 + 5x)$

3. Multiply the following:

$(x + 2)(x - 5)$
 $x^2 - 5x + 2x - 10$
 $x^2 - 3x - 10$

4. Factor the following:

(a) $x^2 + 9x + 20 \rightarrow (x + 5)(x + 4)$

(b) $a^2 - 2a - 15 \rightarrow (a + 3)(a - 5)$

$15, -1$
 $-15, 1$
 $-3, 5$
 $3, -5$
 (6)

Classwork/Homework

Page 167 # 21

21. Factor.

a) $4y^2 - 20y - 56$

b) $-3m^2 - 18m - 24$

c) $4x^2 + 4x - 48$

d) $10x^2 + 80x + 120$

e) $-5n^2 + 40n - 35$

f) $7c^2 - 35c + 42$

e) $\underline{-5n^2 + 40n - 35}$

$-5 (n^2 - 8n + \underline{7})$

$-5 (n - 7)(n - 1)$

$\begin{array}{r} 7, 1 \\ -7, -1 \end{array}$

f) $\underline{7c^2 - 35c + 42}$

$7 (c^2 - 5c + \underline{6})$

\downarrow
 $7 (c - 2)(c - 3)$

d) $10x^2 + 80x + 120$

$$10 (x^2 + \overset{A}{8}x + \overset{M}{12})$$

$$10 (x + \overset{6}{6})(x + \overset{2}{2})$$